The British Veterinary Journal

AUGUST 1959

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Vol. 115 **August, 1959** **No. 8**

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EDITORIAL

AN ANCIENT CRAFT MAY DIE

When the roads were full of horses toiling at man's behest, ordinary men, the clerk, the shop assistant or the teller in a bank, seemed to have little interest in the noble animal which pulled the bus or coal cart. Horses were taken for granted and, like the railway engine, they were necessary for the convenience of *homo sapiens*. The average man was not interested in their form or action or the tack which they wore. Relatively few were knowledgeable on the mysteries of the harness or the yoke, and on those special occasions when they took the reins of a hired conveyance they used them with less grace and understanding than a helmsman grasps the guide ropes on a tiller.

A horse was just a means to an end and the general public gave little attention to how the slaves were fed and housed, shod or used. These were matters which could be left to grooms and ostlers and other sly, sharp-featured men with whom it was not "nice" to be associated too closely. Always there was one man who lived by horses and was held in great renown. He was the farrier, the King of Craftsmen, privileged by royal decree to adorn his apron with a fringe, and beloved of poets and children. This worker of iron was one of the most important men in his community, for all other craftsmen were dependant upon him; he made their tools. He ranked high in parochial affairs for he was well informed on many things not directly connected with his craft, and which were not within the ken of his neighbours. His forge was the Fleet Street of the parish, the rendezvous of news and a place for concourse and debate. News arrived from near and far and after appropriate cogitation and digestion it was disseminated again by the horsemen whose charges wore the farrier's shoes.

When the railways spread their webb across the countryside there were those who thought that the days of the farrier were gone, but this was not to be. Railways stimulated commerce and the interchange of goods. The roads which had echoed to the call of the coachhorn slumbered for a while and then woke up to carry a greater volume of transport than ever before, and road transport meant horses and more horses.

For almost 100 years after the introduction of railways, horses and farriers had their heyday. Then the internal combustion engine invaded the roads and the twilight of the working horse began. Two world wars accelerated the onset of night. If it had not been for the exigencies of these wars the twilight would have lasted much longer and it is doubtful if it would have merged into darkness for many years to come.

Many farriers had to close their forges and the good craftsmen dispersed to other occupations. It looked as if the doom of the farrier was sealed. But strange things happened; the cult of horse riding revived and many of the farriers who had remained in business began to prosper better than had been their lot in the so called golden days. People, and especially those that were young, began to yearn to ride on a horse, and the science of riding, and it is a science as well as an art, flowered as it had not done since the 18th century. It was as if the people turned again to the horse in revulsion from the inanimate petrol engine with its noise, speed, fumes and dangers. Today there are probably more people interested in the art of horsemanship than has ever been the case. A visit to one of the many agricultural and horse shows and gymkhanas will furnish manifest evidence of this change.

Unfortunately, or fortunately, horses must be shod, and the shortage of farriers has become a serious matter. In some cases horses have to be transported many miles to reach a farrier's shop. In many cases those farriers who are still in business and have responded to the modern needs have more work than they can do. Many of these men are sere and the period for which they can work is limited by *anno Domini*, and there are few young men training to step into their shoes. Steps, and urgent steps, must be taken to find a remedy. The situation at the present time is serious but it is still possible to get a horse shod. What of the future? If the number of farriers continues to decline the time may come when it will be impossible to get a horse shod. Motorcars cannot journey without tyres and neither can horses travel and work without shoes. The best remedy lies in stimulating young men to enter the trade. They can be assured of an interesting and worthwhile job which can give substantial reward. Schools of Farriery should be established at the veterinary schools and agricultural colleges and at various other selected sites throughout the country. Scholarships should be awarded by county councils and other bodies to enable boys to attend the schools or serve an apprenticeship under an approved master. These are some of the ways in which we can make provision for the future and ensure that the return to the horse with all its attendant joys can be accomplished. Who will take the first step? It should be the veterinary schools, for the veterinary profession is deeply involved. If the first impetus was given by the schools others would follow in emulation, and the future would be assured. The Worshipful Company of Farriers might awaken from its slumber.

THE ROLE OF VETERINARY EPIDEMIOLOGY IN RELATION TO PUBLIC HEALTH

by R. A. TJALMA, B.Sc., D.V.M.*

Responsibility for the public health is not vested in any one group of individuals. Every individual, regardless of his calling, shares in the responsibility for the overall welfare of society. Veterinary medicine, by virtue of the fact it is immediately concerned with zoonotic diseases, has certain obvious and well-defined public health responsibilities. This obligation is not confined to those veterinary surgeons engaged in formal public health activities; rather it exists in every situation wherein the public health is threatened. The veterinary clinician in private practice has, in many instances, a well-defined responsibility for the health of his client as well as the health of his patient. Veterinary public health comprises all the community efforts influencing and influenced by the veterinary medical arts and sciences applied to the prevention of disease, protection of life, and promotion of the well-being and efficiency of man.

Considerable progress has been made in the scope and function of veterinary public health since World War II. Indeed, the period immediately following World War II has been referred to as the "renaissance of veterinary public health". The personnel demands created by the emergency of war served to provide many public health opportunities for the veterinary profession. Likewise, the increased importance of the zoonoses has necessitated that graduates in vetinary medicine be charged with the responsibility for certain aspects of the public health. This increase in the public health significance of the zoonoses occurs as the result of two main factors. First, the adequate control of many human epidemic diseases has resulted in a relative increase in the importance of the zoonoses. The prevention and/or control of cholera, smallpox, typhoid and other similar diseases has served to promote the prevention and control of zoonotic diseases. Second, research in the field of the zoonoses has resulted in the identification of "new" zoonotic diseases and a number of previously unrecognized implications of known zoonotic diseases have been demonstrated. Examples of this sort might include the suspected relationship between human mental illness and western equine encephalomyelitis infection, the recent implication of brucellosis as a suspected cause of human heart disease, and the recognition of *Leptospira pomona* as a not uncommon cause of aseptic meningitis in man. Considerations of this nature have resulted in an absolute increase in the significance of the zoonoses.

Speculation as to the possible causes and factors which have promoted and/or permitted the zoonotic diseases to assume a position of greater public health significance leads one to consider the cultural aspects of changing disease patterns. A

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Presented at the Conference for Teachers of Veterinary Public Health and Preventive Medicine, Communicable Disease Centre, U.S. Public Health Service. June 12, 1958.

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review of the historical literature on animal disease control suggests that such diseases may be expected to assume public health significance at two periods in the evolution of a society. A primitive society is largely dependent on its animal resources for food, power and transportation. Any disease which succeeds in destroying the animal resources of such a society is an obvious and direct threat to the health and welfare. Under these conditions, the disease in question need not qualify as a zoonotic disease as defined today. The possibility that the disease in question may be naturally limited to a single species of domestic animal in no way minimizes the effect on the public welfare. The social impact of such a disease situation is immediate and direct. Famine, war and epidemic disease are the natural consequences of certain epizootics in primitive societies. History has recorded many such occurrences. Rinderpest, originating in Asia, has, through the centuries, repeatedly invaded Europe with disastrous effect on the public welfare. Foot and mouth disease has been responsible for many situations wherein the public health was involved. Contagious bovine pleuropneumonia has a notorious history of causing economic and agricultural collapse in many parts of the world.

The second " social period " wherein animal diseases may be expected to assume public health significance is characterized by technological advance, relative economic security, and public and individual protection from epidemic disease and starvation. Under these conditions certain animal diseases are considered to be of public health consequence by virtue of the fact they are transmissible to man and thereby constitute an actual or potential direct health hazard. They are important because they are zoonoses. We have arrived at this social period.

Thus, at either end of the cultural spectrum, and for different reasons, one might expect certain animal diseases to be regarded as important to the public health. In all probability, the actual health implications of the zoonotic disease change little, if at all, as one progresses from the primitive to the advanced cultural situation. The variable factor would seem to be one of changing social emphasis as dictated by the existing needs of that particular society.

Many of the contributions and most of the progress evidenced by veterinary public health during the last 20 years has been in the field of zoonotic epidemiology. As previously indicated, the prevailing level of social and cultural development during this period has favoured advancement in this particular area. Conversely, and equally important, much of the veterinary public health activity of the last several decades, although labelled " epidemiology ", does not qualify as such. Epidemiology is defined as " the scientific discipline concerned with the mass behaviour of disease and injury in groups of people ". In another sense, epidemiology might be defined as the demonstration, identification and evaluation of constant factors in varying situations.

The acute infectious diseases served as the developmental basis for epidemiology. Indeed, epidemiology evolved as a function or mechanism of acute infectious disease control. Only recently has epidemiological " methodology " been applied to chronic diseases and other problem areas such as accidents, mental health and even sociology. Likewise, zoonotic diseases have been subject to epidemiological study for a relatively short period of time.

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The science of epidemiology has progressed through four more or less distinct development stages. A valid appraisal of epidemiological function in a new area, such as represented by veterinary public health, requires that consideration be given the various phases of epidemiological development. It is, or should be apparent that methods of action which have developed over a long period of time in a specific disciplinary area may not be completely applicable in a new and perhaps underdeveloped field.

At the onset, the study of disease was primarily descriptive. Little or no thought was given the matter of identifying constant factors. Each individual situation or episode was evaluated on an absolute basis without reference to similar situations. Following this, there developed a comparative method for the study of disease. This phase, at its peak in the early 1800's, was devoted in large part to the retrospective study of epidemics. The important contribution from this period was the recognition of the necessity for comparing similar events which had occurred at different times and places.

During the latter part of the 19th century, the epidemiological method became analytical in nature. This period was characterized by the development of "shoe leather epidemiology", perfection and application of statistical methods and the recognition of epidemiology as a practical operational procedure in health departments. Snow, Frost and Rosenau, among others, contributed much towards establishing "analytical epidemiology". Modern epidemiological technique is, almost exclusively, of the analytical variety. The experimental approach, by which it is possible to identify and quantitate factors responsible for epidemiological phenomena, represents the most recent development in epidemiological research and practice.

The change from any one epidemiological period to the next was gradual. Likewise, each succeeding period or development in the methods employed was based on the experience gained in the preceding phase. Recognition of this fact points out the necessity for reverting occasionally to older forms of epidemiology when attempting to apply epidemiological methods in a new field. Such would seem to be particularly true of certain aspects of veterinary public health activity. The profound lack of information on certain zoonotic diseases more than justifies a partial return to the comparative and descriptive methods.

Compared to chronic diseases, the epidemiology of acute infectious diseases is unique in several respects. Many, if not most, of the acute infectious diseases are characterized by a sudden onset, a relatively short incubation period and course, a defined clinical syndrome and the ability to spread or be transmitted rapidly through a given population. All these factors facilitate epidemiological investigation. By the same token, these characteristics may be said to complicate epidemiological study. The sudden onset and rapidity with which such diseases progress necessitate that the investigator "leave his chair and proceed directly to the field". Acute infectious disease, like crime, is best investigated immediately and at the scene of action. Consequently, the epidemiological investigation of the acute infectious diseases is necessarily of the "shoe leather" variety in most instances. Likewise, the emergency nature of such diseases demands immediate action irrespective of existing facilities,

environment, weather and time. Another factor often thought to contribute to the epidemiological difficulties of acute infectious disease is the frequent lack of any well defined division of labour, especially at the professional level. The physician may find himself operating in the field of the sanitary engineer, the bacteriologist functioning as an entomologist, the veterinarian serving as an investigator of human disease. This is particularly true as regards the epidemiologic investigation of zoonotic diseases.

On an operational basis there exists a considerable difference between the epidemiological approaches to the acute infectious diseases and the chronic or non-infectious diseases. The epidemiology of chronic disease is largely retrospective in nature. The relatively stability of a chronic disease situation affords ample time for exhaustive diagnostic procedures, detailed case investigations and analysis of results on a continuing basis. Conversely, the absence of a recognized incubation period, rapid transmission, and an obvious clinical syndrome precludes the early demonstration of a specific disease pattern or other epidemiological characteristics.

According to the definition set forth by the World Health Organization, the term zoonoses designates those diseases naturally transmitted between vertebrate animals and man. Many of the zoonotic diseases are of the acute infectious variety and, in addition to the characteristics of that group of diseases, have certain distinctive features. They are, under most circumstances, diseases of morbidity rather than mortality. A broad host spectrum among the lower animals is characteristic of such diseases. Human zoonotic infections are usually " dead-end " in that human to human transmission rarely occurs.

Epidemiology of the zoonotic diseases is complicated by the fact that such diseases rarely occur as epidemics; rather they tend to occur in endemic form. The limited number of cases occurring among the human population of any one area at any one time complicates epidemiological study. Under such conditions analytical epidemiological methods, designed specifically for epidemic situations, may not be completely applicable. An effort should be made to document and describe such diseases on a comparative epidemiological basis. Human rabies infections constitute an excellent example of such a disease. Likewise, one might attempt to enlarge the geographical study area so as to include a greater total number of cases, and thereby justify application of analytical epidemiological methods of evaluation.

Conversely, the absence of epidemic zoonotic disease may be partially compensated for by applying classical analytical epidemiological methods to animal populations. The observation of epizootic patterns of zoonotic disease will frequently serve to indicate the presence of human zoonotic infections. Subject to epidemiological interpretation, zoonotic disease patterns in animal populations tend to reflect the concurrent situation in the human population. Such an approach is perhaps best exemplified by the classical investigations of equine encephalitis which led to the recognition of equine infections as indicative of potential human infections in the same area. Likewise, it has been our experience that the observation of epizootic patterns of Q fever and leptospirosis may facilitate the identification of high risk exposure groups and the subsequent documentation of human infection.

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Another factor contributing to the complex nature of zoonotic epidemiology is the dual host-parasite relationship involved. The zoonotic disease situation may be compared to an equation, one side of which represents the host-parasite-disease complex as it exists in the animal, the other side as it exists in man. The two sides of the "zoonotic equation" are quite different epidemiologically. The host-parasite relationship, the nature of the resultant disease process, and the influencing environmental factors are apt to vary considerably from one side of the equation to the other. Q fever is an example of a zoonotic disease wherein profound differences may be observed between human and animal infection. Cattle appear to contract the disease by direct contact with infected cattle, and subsequently remain free of all signs and symptoms of disease. Conversely, man most often becomes infected following the inhalation of contaminated dust, and usually manifests obvious symptoms of acute infection. Adequate investigation of the zoonoses necessitates that both sides of the equation be taken into consideration. This overlapping of human and veterinary medicine has resulted in the creation of a professional "no man's land". Neither side, so to speak, has been eager to assume responsibility in this area of overlap. The team approach has, to a degree, solved this problem. However, the team approach will not provide a complete solution.

The epidemiological study of infectious disease, in the operational sense, is supported by three different areas of activity which may be identified as clinical, laboratory and field. Each of these areas contributes certain essential ingredients, the sum of which constitutes epidemiology. Depending upon the circumstances, any one of these may provide the clue or initial stimulus in the epidemiological investigation of a particular situation. In many instances, it may appear as though the total epidemiological approach consists only of clinical, laboratory or field activity. Seldom, if ever, is this true. The data collected in any one of these sections must be confirmed, tested, and analyzed against the disciplines of other areas.

Effective zoonotic epidemiology requires that each of these three operational spheres be given consideration on both sides of the "zoonotic equation". As indicated previously, there exists an overlapping between human and veterinary medicine in the field of zoonotic epidemiology. This overlap consists primarily of investigation in the field which is only one of the necessary operational areas. The public health veterinarian has demonstrated his ability to assume and discharge responsibility in this area.

The veterinary profession has only begun to recognize the potentials of epidemiology. This applies equally well to veterinary medicine per se, wherein the term should be epizootiology, and to veterinary public health. The veterinary profession has shown surprisingly little interest in applying epidemiological methods to the study of animal disease. The practicality of such an approach is obvious. Likewise, the public health veterinarian, concerned with zoonoses control, has not, in many cases, taken full advantage of the opportunities available to him in the field of infectious disease epidemiology. All too often the public health veterinarian is content to investigate reported cases of zoonotic diseases. This must be considered as "acting after the fact". Little effort is put forth to establish mechanisms whereby zoonotic disease is identified and documented.

The changing emphasis in infectious disease control has afforded the public health veterinarian an unparalleled opportunity to function in and contribute to the public health. The zoonotic diseases have, as a result of social development, assumed greater public health significance today than at any other time in history. This aspect of the public welfare must be recognised as a responsibility of the veterinary profession. The complexities of zoonotic epidemiology must be recognized and mastered. Complete utilization of all methods for the investigation of zoonotic diseases by all branches of the veterinary profession, will necessitate a partial or temporary return to earlier forms of epidemiology, particularly that of descriptive documentation on a comparative basis. Experimental epidemiology is a field which requires the attention of the veterinary epidemiologist. There is a definite trend to utilize veterinarians as medical ecologists rather than as investigators of zoonotic disease. Indicative of this trend is the growing demand for veterinarians to work on non-infectious disease problems such as radiation, air pollution and occupational health. The future of veterinary public health is limited only by the ability of the profession to recognize its opportunities and accept its responsibilities.

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World Health Organization Technical Report Series No. 40, May 1951, p. 3.

PLATE 1

FIG. 1

Photomicrograph of the slice of a haemal node showing the well-defined capsule at the periphery with well-developed trabeculae in the medulla. The lighter-stained areas are sinuses which are filled with blood. Leishman stain. x 15.

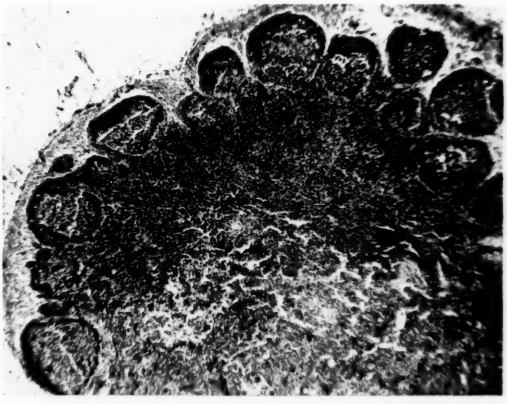

FIG. 2

Photomicrograph of the section of a haemal node. Note the thick capsule separated from the nodules by the capsular sinus. An outer cortex having nodules with germinal centres and an inner medula is observed. Haematoxylin and eosin. x 19.

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PLATE 2

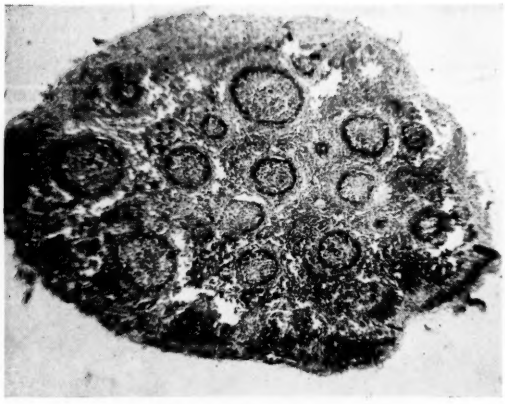

FIG. 3

Photomicrograph of the section of the haemal node showing a uniform distribution of the lymph nodules with large germinal centres. Medullary sinuses are filled with blood. Haemalum and eosin. x 23.

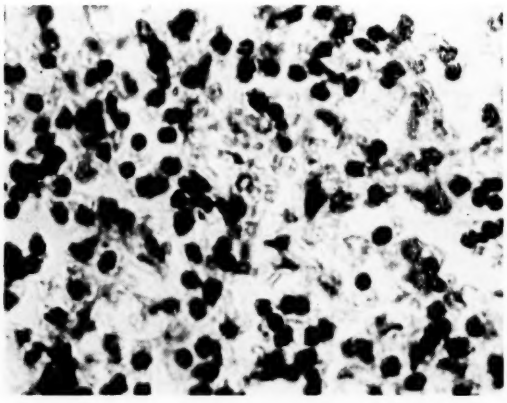

FIG. 4

Photomicrograph of the slice of a haemal node from medulla. Erythrocytes, lymphocytes and haemocytoblast are seen. Giemsa stain. x 750.

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ON THE MICROSCOPIC STRUCTURE OF HAEMAL NODES OF BUFFALO CALVES

By AMREEK SINGH

College of Veterinary Science and Animal Husbandry, Mathura, India.

Preamble

A description on the microscopic anatomy of the haemal nodes of buffaloes is not available. The account given in Trautmann and Feibiger (1952) of these structures in ruminants is far from complete. In the present work some of the findings described earlier by Trautmann and Feibiger (1952), and Maximow and Bloom (1957) have been confirmed. Reference has been made to the haemopoiesis in haemal nodes, a search of available periodical literature reveals that there are a few records available. The haemopoietic propensity of these nodes was studied also. This could be of considerable interest to those concerned in research on and the treatment of blood diseases.

Materials and Methods

The specimens were obtained within two hours of the death of the buffalo calves. The haemal nodes were collected from the retroperitoneal fat, along the course of the abdominal aorta, and from the neighbourhood of other large lymph nodes especially those of body cavities.

These nodes were fixed in 5% formol saline, embedded in paraffin wax and sectioned at 4 microns. Slices were stained with Delafields' haematoxylin and eosin, Mayers' acid haemalum and eosin, haematoxylin and von Gieson's solution, Leishman's stain and Bayley's Giemsa (after Carleton 1957) stain.

Histology

Each node is enclosed in a fairly thick connective tissue capsule. The capsule is loosely attached to the surrounding tissue—usually fat, and it is not unusual to see adipose tissue adhering to the outer region of the capsule. From the capsule, which is composed of collagenic and elastic fibres with which are mixed a fair amount of smooth muscle, bands pass towards the interior and help to support the parenchyma. This arrangement creates irregular partitions. These trabeculae are developed best and branch extensively in the central region (Fig. 1). Blood vessels are carried in the larger trabeculae. As with the spleen, there are no afferent and efferent lymph vessels.

The reticular framework arises or is connected to these trabeculae. The parenchyma is lodged in the meshes. The course-meshed areas occur under the capsule and constitute the sinuses through which blood percolates. The reticular cells and the reticulo-endothelial cells are entangled in the cobweb of argentophil fibres.

The parenchyma is a mass of lymphatic tissue which is demarcated into two distinct regions. It is separated from the capsule and trabeculae by a system of well-developed channels which are filled with blood. The various blood sinuses are con-

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spicuous at places due to the absence of free cells. A division into an outer cortex, (an area with a sprinkling of well-defined nodules of varying shapes and sizes showing a characteristic pallor in their centre), and the inner medulla, (an extensive mass of diffuse lymphoid tissue intermixed with which are numerous erythrocytes and other myeloid cells), is observed (Fig. 2). This division is reminiscent of the structure of a lymph node. It is not uncommon to see lymph nodules in the centre of the node. In the haemal nodes of one animal under investigation, the author encountered an uniform distribution of lymph nodules that were seeded over all areas (Fig. 3). Frequently, there is a preponderance of the medulla over the cortex. There is no sharp line of separation between cortex and medulla. Cells of lymph nodules, of the cortex, are populated by cells of lymphocytopoietic series. The medulla is packed with cells representative of myeloid tissue intermingled with which are lymphocytes (Fig. 4).

Discussion

Schumacher (1912) cited by Le Gros Clark (1952) cast doubt on the very existence of these structures. He states, " The presence of haemal nodes in the human body is doubtful, and even in mammals in which they do occur, e.g., sheep, it is uncertain whether they are always distinct entities rather than transformed lymphatic nodes ". However, the consensus conforms with the present finding that haemal nodes are definitely independent structures present in ruminants; the species used in the investigation is buffalo (*Bos bubalis*). Trautmann and Feibiger (1952), Kudo (1953), Ham (1957) and Maximow and Bloom (1957), who have worked on ruminants other than buffalo, also favour this view. The fact that there are no afferent or efferent lymph vessels, and that these nodes are not inserted in the course of lymphatics make them fundamentally different from lymph nodes. There is a well-defined blood channel system and the course of the blood through this system is quite dissimilar from that of spleen and therefore, distinguishes them from latter.

The amount of smooth muscle intermingled with the collagenic and elastic fibres in the capsule is substantial. This might be a provision to push into the general circulation the forming elements of circulating blood, from their birth-place.

Apart from Erencin (1948) other authors like Trautmann and Feibiger (1952) and Sisson and Grossman (1953) are sympathetic to the concept that the parenchyma is a uniform mass of lymphatic tissue. In the haemal nodes of buffalo calves a division into a peripheral cortex, in virtue of the presence of distinct lymph nodules, and a central medulla, which is diffuse lymphatic tissue, is clearly seen. So much so that in one case the substance was arranged in characteristic rounded bodies uniformly throughout the node. It is not denied, however, that the demarcation between the two regions is not very sharp.

It was interesting to observe in the medullary zone, cells of myeloid series in various stages of development. On the other hand, direct evidence of lymphocytopoiesis was obtained from lymph nodules in the cortex. Both areas contained the adult counter-parts of these cells also. The mere presence of immature and mature elements of blood, however, does not signify these areas to be haemopoietic. The cells could have

migrated from the lumen of blood vessels which abound in the substance. Haemal nodes should not be assessed on the basis of histological appearance alone, in the absence of other evidence. From the cytological point of view, it can be concluded that these nodes have characters similar to that of spleen. The significance of these structures in the pathology of blood disease can be of great importance and a close study might reveal things hitherto not known.

It can be presumed that these nodes, because of the lymphoid tissue they contain, which is interposed in the course of blood vessels, are designed to filter blood. But overall, can such a limited amount of tissue filter any sizable amount of blood?

Summary

The microscopic structure of haemal nodes of buffalo calves has been described in some detail. Departures from the conventional description have been noted and bearing of haemopoiesis on blood diseases has been discussed.

Appreciations

I express my gratitude to Mr. C. V. G. Choudary, B.Sc., M.R.C.V.S., Principal, U.P. College of Veterinary Science and Animal Husbandry, Mathura, for his inspiration and valuable guidance throughout the present work. I thank Mr. Hazari Lal also for his help in these studies.

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SOME ASPECTS OF MEAT INSPECTION

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In this country the term " Meat Inspection " is not always regarded as being synonymous with " Applied Animal Pathology ". The latter title signifies a complete meat inspection service, which includes ante-mortem, post-mortem and laboratory inspection.

The term " post-mortem " inspection seems to be restricted to the examination of meat in slaughterhouses, meat markets, shops and stalls. That is the way the term is used in all Government Regulations and Memoranda on the subject. There is very slight reference, if any, to the inspection of the live animal, and less to cover the examination and recording of post-mortem findings in animals arriving dead in the transport to the slaughterhouse, or dying on arrival at the lairages, and whilst awaiting slaughter. Most publications, apart from standard veterinary works on Meat Inspection, ignore the fact almost completely that such an inspection consists of three important stages, viz: —

(a) Ante-mortem inspection.
(b) Post-mortem inspection.
(c) Bacteriological or Laboratory Inspection.

In the document called " Memo 3/ Meat ", which took the place of the older " Memo 62/ Foods " in 1953, the first word appearing in the first paragraph is " Carcases ", and this seems to set the pattern for the contents in general, except that " Ante-mortem inspection " in Part 2, takes up two lines and one word, whilst the third stage I have mentioned, that of " Laboratory or bacteriological inspection ", is dismissed in three lines.

As an illustration of the way the idea of a live-animal inspection has been dropped almost completely, or at least, pushed into the background by the " dead-meat inspection mentality " that has grown up during the years let us compare the way both " Memoranda " deal with the subject: —

The older " Memo 62/ Foods " starts with: —" General observations for the guidance of Inspectors and Butchers ".

" A.—Ante-mortem Inspection."

" Where practical it is desirable that all animals should be inspected before slaughter, the object being to ascertain that each animal which it is intended to slaughter is in a satisfactory state of health. In cases of doubt as to the healthiness of the animal the meat inspector should notify the veterinary inspector, if one has been appointed for that purpose, and his instructions should be observed. Where ante-mortem inspection of animals is not practicable or has not taken place, the butcher should notify the meat inspector or Medical Officer of Health in any case in which he has doubt as to the healthiness of any animal, who should take immediate steps to have the animal examined before slaughter."

(There is a note about the duties of reporting the suspected Scheduled Diseases under the Diseases of Animals Acts & Orders).

" Memo 3/ Meat ", which is now operative, starts off with the heading " General Guidance for Authorised Officers, Occupiers of Slaughterhouses and Slaughtermen ". All this under Part 1, whilst Part 2 is headed:—

" Ante-mortem inspection "

" All animals should be inspected before slaughter and whenever possible those showing symptoms of disease should be segregated and slaughtered separately."

(The Diseases of Animals provisions are referred to in a footnote, as in the previous Memo 62/Foods).

The older " Where practicable . . . if one has been appointed " (referring to the veterinary inspector, has been dropped from the newer memorandum. As there are veterinary surgeons practising their art all over these islands, it is difficult to see where " ante-mortem inspection " was ever " not practicable ". It would be interesting to know how many times a meat inspector or Medical Officer of Health have taken " immediate steps to have the animal examined before slaughter."

The present Memo 3/Meat does state that the animals *should* be inspected before slaughter, but not a word as to who does the " inspection ", and once more we have the " where possible those showing symptoms of disease should be segregated and slaughtered separately." The truth is that as Meat Inspection is a Local Authority service in Britain, there was never any hope from the start that the recommendations, concerning ante-mortem and laboratory inspection, of the Committee on Meat Inspection which reported in 1922, would ever be put into effect. The latest "Memorandum" is thus more honest than the old one.

Regarding the laboratory inspection, the document advises inspectors that " specimens from emergency-slaughtered animals which showed symptoms of disease, should be submitted for laboratory examination whenever necessary ". We are not told who does the examination or who is responsible for the diagnosis, and what qualifications these individuals should possess. There is not a word to encourage the Inspector to build up his own little laboratory, if only for microscopic examinations.

It is no wonder that any article dealing with Meat Inspection invariably covers stage (b) only. Young Public Health Officers up and down the country sit for examinations in Food Inspection without ever having handled or examined a live animal, and Medical Officers of Health are equally unconcerned about stage (a). It is only in those places where men trained in animal anatomy, physiology, pathology and other disciplines appertaining to the recognition of health and disease, i.e. veterinary surgeons, are in charge of the meat inspection service that we find that stages " a ", " b ", and " c " are carried out. Most Public Health Officers have no experience in the handling of live animals.

Knowledge of the animal in health, and of the changes taking place in meat enables the veterinary surgeon to clamp down on the bad habit, which has grown up in some places since the days of war-time control, of slaughtering animals immediately they arrive at the abattoir—" straight off the journey " as the butchers describe it.

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No reputable butcher, trained in the old school, and having served an apprenticeship in the trade, would dream of slaughtering an animal without giving it adequate rest prior to bleeding-out.

The placing of " administrators " in charge of slaughterhouses, and without the necessary technical knowledge of the trade, led to some amazing things being done during " control " years. This bad custom of slaughtering animals " off the journey " was one of them. With the passing of the war-time administrator this bad method declined, but it has not vanished completely, as any consumer who attempts to eat some " leathery " meat knows. Whatever may be said for and against the Master-butcher in his " one-man business ", he at least knew how to train apprentices in all branches of the trade, and how to pass on knowledge acquired by precept and experience. A good butcher was an artist in his craft and he knew how to satisfy his customers with tender meat, and delicious sausage or pies whose meat-content was real meat. He would have disdained to use German made machines for the emulsification of bacon rind and " lights ". Laboratory inspection may involve the dissection and examination of certain foods, to help determine their meat content, it requires anatomical knowledge also, and a familiarity with histology in particular. The Public analysts are the men who can deal with the chemical side of such investigations.

I seem to remember that when the old Ministry of Food operated during the war, a most effective little order was issued. It simply laid down that such things as " lights " and spleens etc., were not to be used as edible meat. That little order passed away when the Ministry of Food was merged with that of Agriculture & Fisheries, and reputable manufacturers of meat know how the certain individuals have welcomed that passing.

It is not necessary for a Meat Inspector to send suspected material to County Laboratories always. With a little effort he can establish his own small laboratory, where he can carry out pH tests, microscopic slide examinations, and other simple routine tasks.

Every Inspector will bear the Scheduled diseases constantly in mind, but what has interested me in particular since I commenced doing meat inspection many years ago, is the importance of accurate post-mortem examination and the recording of the findings in animals dying in transit or in the lairages.

One is more likely to find a dead animal in a consignment of pigs than in a delivery of cattle and sheep, and this is particularly true when pigs are sent by road or rail during hot weather. The custom some breeders have of giving the animal a good feed before loading on the farm does not help. When large numbers of pigs are jolted about as they lie on the floor of the transport, an over-loaded stomach pressing on the diaphragm, in an over-fat animal, can soon prove fatal.

Every slaughterhouse should have its post-mortem room, to enable such casualties to be examined and a record made of the cause of death. Unfortunately in many cases no facilities for this type of examination exist, nor are veterinary surgeons called

in to do this work. One may ask what happens to these dead animals, and who is responsible for ascertaining that they have not died from any of the " Scheduled " diseases?

In insured animals, not only is the cause of death of importance to the animal breeder, but the insurers may require some information also. The approximate time of death, and whether it took place before loading on the farm, in the transport, or after unloading at the lairages should be known. Carcases rejected for human food in the second stage of meat inspection, can have suffered from a condition which could have been recognised with ease in the living animal before it left the farm. It is possible that a sick or injured animal may have been deliberately included in a consignment of good quality stock in the hope of " pulling a fast one " over the Meat Inspector. This is information which should be disclosed to the insurers, and it justifies the need for having someone at the slaughterhouse with a knowledge of something more than stage (b) only.

It is not true that there are not enough veterinary surgeons available to assist in carrying out all three stages of Meat Inspection. There are plenty of veterinary surgeons practising their profession within reach of all small towns, as well as in our large cities, and rural areas, and there are many young people leaving our Universities with all the necessary qualifications to enable them to inspect live animals, carry out post-mortem work in an abattoir or on animals which die in transit, and to use the microscope when necessary. The country would be advised to form a panel of such people to tighten up the system of meat inspection, in order to assist Public Health Officers prevent loopholes in the control of certain Diseases of Animals, and protect the consumer.

SOME OBSERVATIONS ON THE HAEMATOLOGY OF ZEBU CATTLE IN UGANDA

by

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The object of this paper is to record some observations that have been made on the blood picture of apparently normal healthy adult Zebu cattle in Uganda. There is a scarcity of information on the subject although Jones (1943), who dealt mainly with the chemical composition of 41 Zebu, Ankole and mixed breed cattle at Entebbe, Uganda, also carried out total erythrocyte and leucocyte counts and haemoglobin estimations. He did not, however, separate the figures for the different breeds, although he stated that there was very little difference between them. Smith (1959) carried out haematological studies on 40 normal Zebu animals kept in a state of husbandry differing little from that practised by most native owners in eastern Uganda.

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The observations herewith recorded were made on the blood from 60 Zebu cattle located on the Livestock Experimental Station, Entebbe, where they are kept under conditions of feeding and management superior to those practised by any but the most progressive African farmers and European managed farms.

Materials and Methods

Cattle: Sixty apparently normal healthy Zebu cattle over 1 year of age, comprising 34 females, 24 bullocks and 2 bulls, were used. They were from a herd that had been at Entebbe, at an altitude of approximately 3,800 feet, for over 10 years.

The methods employed were essentially those described by Dacie (1956).

Blood samples: Single samples of blood from the 60 cattle were used; 2 cattle being bled each day (between 8 a.m. and 9 a.m.) during the period 8th January to 9th March, 1957. During that time, the weather remained comparatively dry since it corresponded with the interval between the two principal periods of rainy weather. All cattle were bled from the jugular vein, thin blood films were made for the differential leucocyte count and blood was collected into a mixture of 6 parts ammonium oxalate to 4 parts potassium oxalate (Heller and Paul, 1934) and was used for the remaining estimations.

Haemoglobin estimations: Haemoglobin estimations were made using a M.R.C. Grey Wedge Photometer (King, Wooton, Donaldson, Sisson and Macfarlane, 1948). The readings obtained were percentage haemoglobin (Haldane scale, 100% = 14.8 g. Hb. per 100 ml.) and these were converted into grams of haemoglobin per 100 ml. of blood.

Packed cell volume: The packed cell volume was estimated by the method of Wintrobe (1946), using duplicate haematocrit tubes and centrifuging the blood at 3,000 r.p.m. for 1 hour, through a radius of 20 cm.

Total Erythocyte counts: Erythrocyte counts were made by diluting the blood 1:200 with formol-citrate solution (1% formalin in 3% trisodium citrate). Dilutions were made with a 0.02 ml. pipette and a haemocytometer with improved Neubauer rulings was used, counting 80 small squares. Two counts were made and if an error of 10% was found, repeat determinations were performed.

Leucocyte counts: For the leucocyte count, blood was diluted 1:20 with 2% acetic acid coloured with gentian violet and at least 100 cells were counted in as many 1 sq. mm. areas as were necessary using a Neubauer chamber.

Differential leucocyte counts: Thin films were prepared from fresh blood and stained with Leishman's stain. Two hundred cells were observed by counting straight across the slide approximately half way between the centre and the edge of the smear.

Results and Discussion

The results as shown in the table compare fairly closely with the few results recorded by Jones. The figures reported by Smith, however, vary significantly from them; his means for the packed cell volume, mean corpuscular haemoglobin and neutrophil and lymphocyte percentages being the only ones within a standard deviation of my results.

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The Mean, Standard Deviation and Distribution of Some Constituents of Blood of Zebu Cattle in Uganda.

Constituent	Mean and Standard deviation	Distribution (Number of cattle)								Results recorded by	
		Values outside range	−3	−2	−1 Mean	1	2	3	Values outside range	Jones	Smith
Haemoglobin g/100 ml.	13.8 ± 1.5	—	0	8	24	17	9	2	—	11.7 ±2.3	8.98 ± 1.54
Packed cell volume per cent	35.5 ± 5.4	—	1	11	21	18	7	1	52		32.88 ± 5.18
Erythrocyte count 10^6 p.c. mm.	9.6 ± 0.98	—	2	3	23	23	7	2	—	8.8 ± 1.7	6.12 ± 0.94
Mean corpuscular haemoglobin concentration per cent	39.2 + 2.5	—	2	5	24	23	4	2	—		27.20 ± 1.75
Mean corpuscular volume $c\mu$	36.7 ± 3.4	—	1	9	20	22	6	2	—		53.20 ± 6.27
Mean corpuscular haemoglobin $\mu\mu g$	14.4 ± 1.1	—	0	9	22	22	6	1	—		
Leucocyte count 10^3 p.c. mm.	10.1 ± 0.95	—	1	5	26	21	5	1	13.5	10.9 ± 3.65	14.58 ± 2.14 11.22 ± 2.38
Neutrophils per cent	28.1 ± 3.9	—	2	7	23	26	1	0	41.5		Band 2.22 ± 2.14 Young 1.12 ± 1.27 Neut. 27.52 ± 4.80
Lymphocytes „ „	48.5 ± 3.8	—	1	7	23	23	3	3	—		Small 46.28 ± 6.79 Large 3.38 ± 2.65
Monocytes „ „	12.3 ± 3.4	—	1	8	24	20	4	2	—		6.22 ± 3.63
Eosinophils „ „	9.7 ± 2.6	—	3	4	25	21	4	3	—		12.90 ± 5.12
Basophils „ „	1.4 ± 1.2	—	0	4	25	30	0	0	9		Rare

According to Holman (1955), environment plays a large part in causing the differences found among groups of cattle of the same breed. The area in eastern Uganda where Smith carried out his estimations is at approximately the same altitude as Entebbe, but it is probable that his cattle were suffering from a heavier infestation of internal and external parasites associated with the lower standard of husbandry, and the nutritional level would certainly be much lower than at Entebbe. These factors could account for the differences between the results recorded here and those of Smith, particularly the haemoglobin, erythrocyte and eosinophil leucocyte figures.

The monocyte percentage is rather high when compared to the report by Smith, and when comparison is made with figures obtained at Entebbe in June, 1957, following the "rains", when the mean of duplicate estimations for 10 adult Zebu cattle was 7.6 per cent. Figures for the other blood constituents at this time remained in close agreement, except for the eosinophil percentage which rose to 12.2. The figure for basophil leucocytes is very high by normal standards for cattle in temperate regions. It is certainly raised by a single value of 9 per cent., but basophil leucocytes were consistently present, and were seen in 56 of the 60 films examined.

Holman (1955) pointed out that differences in blood picture between the sexes is not proven. It is felt, therefore, that comparison with the figures recorded by Smith, which were obtained solely from cows, is valid.

The large differences seen between the Entebbe figures and those of Smith would indicate that a wide range of environment is encountred in Uganda, associated with the great variability of nutritional and management levels. Therefore, it is important that accurate estimations should be made to determine the normal blood picture wherever possible and whenever an experiment is performed in which the blood picture is of importance.

Summary

Observations have been made on the haematological picture of 60 apparently normal healthy adult Zebu cattle in Uganda. The techniques employed have been described and comparisons have been made with figures obtained by other authors.

Acknowledgments

I am indebted to Dr. D. H. L. Rollinson and other members of the staff of the Animal Health Research Centre for constructively criticizing the presentation of the work.

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THE SULPHYDRYL CONTENT OF HORSE SERUM

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Laboratory animals are subjected to more frequent and critical examination than the other domestic animals and consequently there is a greater fund of knowledge concerning their blood. A study of the *Index Veterinarius* for the last decade reveals how little attention has been paid to the sulphydryl content of the blood of larger animals, especially the horse. In an investigation carried out in these laboratories, and reported elsewhere (Cook and Steel, 1959), horse serum was used as an antagonist of the antibacterial action of mercuric compounds. No literature values for its sulphydryl content could be found and veterinary authorities in this country confirmed the absence of such data.

Experimental

Samples of horse serum were obtained from a commercial organisation and the material is supplied for the preparation of bacteriological culture media. It is prepared from blood which is collected from the horse's jugular vein. The collection and preparation are performed under strict aseptic conditions.

Attempts to determine the sulphydryl content by titration with potassium iodate were made. By using dilutions of serum, its initial yellow colour was reduced so as not to interfere seriously in the estimations. The technique consisted of diluting 5 ml. of serum with 50 ml. of water, adding 0.2 g. of potassium iodide and 3 ml. of glacial acetic acid and titrating with M/600 potassium iodate solution, using a starch solution as the indicator. Further determinations were made using M/1000 mercuric chloride solution. 10 ml. of 5 per cent. serum was diluted with an equal volume of water and titrated with the mercuric chloride solution, using a freshly prepared alcoholic solution of diphenylcarbazone as indicator. Later, determinations were made using p-chloromercuribenzoic acid. The method used was to titrate 20 ml. of 10 per cent. serum with M/1000 sodium p-chloromercuribenzoate solution, again using diphenylcarbazone as the indicator.

These preliminary estimations were all subject to the disadvantage that the colour of the serum tended to interfere with the visual end-point of the reaction, necessitating the use of dilutions of serum and making replicate determinations more variable. To overcome this the serum was mixed with 20 per cent. trichloracetic acid to precipitate the proteins and it was filtered through a Whatman No. 54 paper. Aliquots of the colourless filtrate equivalent to varying quantities between 2.5 and 10 ml. of serum were neutralised with N/1 sodium hydroxide solution and then titrated with M/500 or M/1000 p-chloromercuribenzoate solution with diphenylcarbazone as the indicator. Neutralisation of the filtrate was essential as the colour of the indicator and its sensitivity is affected by pH.

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Results

These are shown in Table I. Two samples of the serum showed a slight greenish tinge and the protein precipitate was a definite apple-green in colour. The filtrate was colourless and the sulphydryl content was not affected.

TABLE I

The Sulphydryl Content of Horse Serum.

Material	*Method of Estimation*		*Mean Results (expressed as moles—SH/100 ml.)*	*Standard Deviation*
Normal Serum	Potassium iodate		95.1	8.7
	Mercuric chloride		95.4	7.5
	p-chloromercuri-benzoate		95.4	2.1
Deproteinised Serum	p-chloromer-curibenzoate	(a)	94.5	3.3
		(b)	94.1	5.7
		(c)	97.1	3.4
		(d)	95.2	2.5

Discussion

Although sulphur is present in serum, as in all tissues, the amount is small. The sulphur content of blood may be divided into protein and non-protein sulphur, the former consisting mainly of cystine and methionine and the latter being divisible into inorganic sulphate, ethereal sulphate and neutral sulphur. The distribution of these fractions, and their amounts, between the corpuscles and the plasma varies with the species (Reed and Denis, 1927). Denis (1821) reported that the blood of all animals has a higher sulphur content than that of man.

The sulphydryl compounds likely to be found in blood are cysteine, ergothioneine and glutathione. Lefèvre and Rangier (1942) reported that of the total organic sulphur of the proteins of horse serum, 48 per cent. was as cysteine, 37 per cent. as methionine, none as sulphonate and 15 per cent. undetermined. The sulphur in deproteinised horse serum contained 44 per cent. as cysteine, 35 per cent. as methionine, 7 per cent. as sulphonate and 14 per cent. undetermined. Lontie and Beckers (1957) quote literature values for horse serum albumin as containing three cysteine groups per molecule but no methionine. The dialysate from normal horse serum has been reported to possess only very slight mercury-inactivating action, which was attributed to cysteine, (Smith *et al.*, 1936). Most workers agree that glutathione is confined to the corpuscles and ergothioneine was thought to be similarly confined. Jocelyn (1958) has however reported its presence in human plasma.

In the work reported here, no attempt has been made to differentiate between the possible sources of the sulphydryl material and the results are meant to serve as an indication of the order of sulphydryl content likely to be met with in horse serum. For more accurate determinations recourse must be made to more refined techniques. Table I shows that all methods of estimation gave similar results. The mean of all methods being 95.2 μ moles $-SH$ per 100 ml. of serum. In calculating the results of

the mercuric chloride estimations, it was assumed that one molecule of mercuric chloride reacted with one sulphydryl group (Kolthoff *et al.*, 1954) instead of the usual 2:1 ratio. P-chloromercuribenzoate is considered to be a specific reagent for sulphydryl groups, capable of reacting with single groups and with those which appear masked to many oxidising agents (Olcott and Fraenkel-Conrat, 1947).

The sulphydryl content of horse serum appears to be about twice as high as that commonly quoted for human serum. The ergothioneine content of serum appears to be exogenous in origin (Jocelyn, 1958) and varies with diet. The horse's diet is such as makes one anticipate a high level. The horse is also a prolific sulphydryl producer as indicated by the high levels found in the ampullar secretions of stallions (Mann *et al.*, 1957). The stables from whence the serum was obtained contain both geldings and mares of from about five years of age upwards and it is not known whether the age or sex affects the sulphydryl content.

As already mentioned no literature values for the sulphydryl content of horse serum could be found. Patrusev (1938) however reports a glutathione value of 32.6 mg. per 100 ml. of a whole horse blood. This is of the same order as that found in man and cattle (Reid *et al.*, 1948; Kunkel *et al.*, 1954). Higher glutathione levels are found in the blood of sheep, rabbits and guinea-pigs (Thompson and Voegtlin, 1926). The blood of the ox and guinea-pig contains about twice as much ergothioneine as that of man (Lawson *et al.*, 1950) whilst that of the pig is rich in this material (Hunter, 1928).

It is concluded that although horse serum appears to have a relatively high sulphydryl content, there is no evidence to suppose that this is not the case.

Summary

The sulphydryl content of samples of horse serum has been estimated by three methods, using normal and deproteinised serum. All methods gave a mean result of the order of 95 μ moles of sulphydryl per 100 ml. of serum. A comparison of this value with that for other species has been made but, as the blood and serum sulphydryl contents do not usually bear any relation to one another, such comparisons are not of great value. It is believed however that horse serum is richer in sulphydryl content than that of man and other domesticated animals.

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XUM

RELIGION AND ANIMAL WELFARE

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In contemplating one's attitude to animal welfare, one may do so from the biological, the philosophical, the ethical, or the religious stand point and arrive at conclusions which are not necessarily identical.

' Nature ' is inherently cruel. Practically all forms of life depend on other life for sustenance. Animals in the wild state seldom die of old age. Most of them succumb to infectious or parasitic diseases, die from accidental injury, or are killed by other animals. Quite often death occurs whilst they are in the prime of life, in consequence of a lack of stamina—brought about by disease, injury, or malnutrition.

Man is handicapped by the fact that he can attempt to know the truth only through the agency of his own highly developed nervous system aided by his experiences — and both these are limited by his imperfect ' conceptions '. St. Paul, in his first letter to the Corinthians, wrote (viii, 1-2) " Knowledge puffeth up, but charity edifieth. And if any man think he knoweth anything, he knoweth nothing yet as he ought to know." And in xiii, 12, " For now we see through a glass, darkly (as in a riddle); but then face to face: now I know in part; but then shall I know even as also I am known ". Man usually assumes that animals possess faculties similar to his own. Yet the scientific study of animal behaviour is in its infancy and, even if it were a well established science, there must be wide gaps in our knowledge of the way animals ' think ' and feel.

Religious thought has, like other subjects, evolved through the ages and has been profoundly influenced by philosophers and ' thinkers '. There have tended to be interpolations into, and changes in, religions. Emphasis has been laid on certain aspects, whilst other aspects have been modified, or have tended to be regarded of less importance. Some have even been forgotten. Man's convenience, the state of society and the morals of the times have all played their part in moulding current religious thought.

Let us, for a moment, reflect on the dim past of earlier civilisations. Man was not highly organised as he is in most countries today. Many peoples were collections of pastoral nomads, or tribes, wandering from place to place seeking herbage upon which to feed their animals. Man's main objective, in such circumstances, was to increase the number of his animal possessions and thereby increase his wealth and enhance his status. He had an inherently high regard for the vaguely known, but profoundly respected, supernatural forces which ruled his destiny. He worshipped many gods in the belief that those gods would reward or punish according to their whims. He was, therefore, concerned to mollify his gods and enlist their support and goodwill. Each tribe acknowledged, in varying degrees, its particular god or gods. Ancient man believed that the spirit of the tribe could reside in some object which might be an animal and, for this and other reasons, man regarded animals with awe. This tended to prevent him from inflicting cruelty on animals. Later, organised forms

of religion emerged, and as time passed, the various forms of religion often exerted considerable influence on each other. In general, in their early days, religions tended to be very harsh and cruel. Human sacrifices had a not unimportant ritualistic significance, though later on, animals were substituted for the sacrificial human beings. There existed such horrible practices as those of divinations by observation of the moving entrails of animals, disembowelled whilst still alive. The Jews were not exempt from homicidal practices in their earliest days, for Abraham, on Mount Moriah, was prepared to sacrifice Isaac his first born son, until God intimated that the ram caught by the horns in a near-by thicket, would provide a convenient and acceptable substitute. (Genesis xxii).

In many religions, cruelty to animals was taboo—and this was undoubtedly encouraged by a belief in life beyond this world as exemplified in such religions as Hinduism and Buddhism and that of the ancient Egyptians. The Egyptians held the cat in veneration, since cats (and other animals) were thought to have spirits which survived after death. Cats were often embalmed, and large cemeteries were set apart for the reception of their mortal remains. The Egyptians' attitude towards the cat was, perhaps, not dissimilar to that of the Hindu towards the sacred cow.

The North American Indians believed in the kinship of man and animals. The totem animal was regarded as an elder brother, whilst beavers were spoken of as little brothers. It may, perhaps, be argued that this reflected not so much an inherent love for animal life, as respect and fear of the spirits which, it was thought, resided in various animals. In an attempt to placate these spirits, it was good policy to give utterance to expressions which were calculated to deceive the spirits into thinking that man regarded their animal hosts with tolerant kindness. Whatever the motives, this belief prevented much cruelty to animals. Confucianism was undoubtedly sympathetic to animal life, although kindness to animals was most marked in such religions as Hinduism and Buddhism — and later also Zoroastrianism — in which the sacredness of all life is so dominant a feature. This attitude to animals was strengthened by belief in an existence after death. Indeed, most religions, originally tended either to over emphasise the kinship of animals to man, or to show respect for animal life for various reasons — some of which were probably based on fear or material considerations.

With the advent of the Dark Ages, man drifted back into ignorance and confusion and civilisation slipped back many centuries. Man's progress, however, has never been like a straight line, it has been rather more like a series of curves or a graph slipping back, recovering, but ultimately going forward.

In the Middle Ages, religions tended to lose sight of many of the principles upon which they were founded: the church of Rome and its use of the Inquisition is an example. Religious thought, at this time, was being influenced by the writings of such men as St. Thomas Aquinas who, in turn, was largely inspired by the Arabic translations of Aristotle. During the Middle Ages, the tradition of Greek learning was mainly in the keeping of those who spoke Arabic and, to a large extent, these were Jewish people. At that time, there was not so sound an understanding of the early Greek tongue as we now possess, and there were divergent interpretations of the

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teaching of Aristotle. In the main, there were two schools of thought, those of the Muslim philosopher Averroes (1126-1198)—whose teachings incidentally were acceptable to quite a body of Christians but never to the Church at Rome—and those of the Jew, Maimonides (1132-1204) whose opinions were more generally accepted by the mass of Christians. Aristotle was so highly regarded at the time, that any claim that an opinion originated from so great a Greek scholar was swallowed hook, line and sinker by most people. Many travesties of his real teachings were thus propagated. Many religions had tended to exalt animals to an equality with man—as that of Buddhism which will not tolerate the taking of life, even should it exist to the detriment of man—(the Buddhists will endure the bite of a flea, yet take no steps to destroy such vermin). Aristotle, however, contended that man was superior to the 'lower' animals which, he taught, had no souls. This aspect of his teaching was developed by Christians (i.e. Thomists) and Mohammedans alike so that their attitude to animals underwent a marked change; for to be without a soul was, to them, to be without rights. Their duty to animals was almost entirely forgotten and animal welfare lost its true place in Islam and has never since regained its importance in the Christian Church.

Mohammed enjoined a love and respect for animals. "Every creature knoweth its prayer and praise". "Verily there are rewards for our doing good to dumb animals and giving them water to drink"; "Animals as well as men are accountable to God, and will stand before Allah on the Day of Judgment", are examples of the attitude to animals which are to be found in the Koran and other Muslim writings. This regard for animal life has been negated also, to a large extent, by the fatalistic outlook of the Mohammedan, and Wensink, in the "Muslim Creed" writes, "It is absurd to suppose that Allah would wrong anybody. He is free to impose suffering on innocent children and animals".

The basic idea of Hinduism is that all life is an emulation or extension of the Deity—in contrast to the Jewish, Christian and Muslim beliefs that life is created by God. The Hindu approach to animal welfare is exemplified in 'The Thirteen Principles of Upanishads' by R. E. Hume thus:—"Lo verily not for the love of cattle are cattle dear, but for the love of the soul, are cattle dear". The fatalistic outlook of the Hindu has also tended to make him disregard animal suffering whilst at the same time, being adverse to the taking of animal life. The Hindu believes that an animal may possess the soul of a departed person who is in the animal body, atoning for the sins of a former incarnation. This idea leads to an unwillingness to interfere with the divine prerogative and thus hinders attention to suffering animals—indeed it may tend to encourage cruelty to animals by the indifferent person.

The idea of kinship with animal life has lead some sects to abolish animal sacrifices, whilst the Jains have so developed the idea of kinship with, and respect for, animal life but at the same time lack of pity for animal suffering, that they have actually established homes for diseased and injured animals so that they may be preserved in their pain rather than be given a merciful relief from their miseries. It is held that to take life, in any form, is no less a crime than murder.

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Judaism affirms that God created all life and found it good. On that basis rests man's duty to animals. " God created man in his own image, in the image of God created He him; male and female created He them. And God blessed them and God said unto them, Be fruitful, multiply and replenish the earth, and subdue it, and have dominion over the fish of the sea and over the fowl of the air, and over every living thing that moveth upon the earth ". (Genesis i, 27-28). The Almighty allowed man to use all things on earth for his just needs; but not to abuse them. Animals which had been used in the service of man must be allowed, like man, to rest on the Sabbath (Exodus xx, 10 and xxiii, 12), and the seventh year of rest for the fertility of the soil was equally to be given to the animals which grazed thereon (Leviticus xxv, 7). A man is commanded to help a suffering animal even if it is the property of an enemy (Exodus xxiii, 4 and 5, & Deuteronomy xxii, 4). The Mosaic Law prescribed the duty of man to animals, plants and the soil, and animal welfare was axiomatic in Judaism, " A righteous man regardeth the life of his beasts; but the tender mercies of the wicked are cruel " (Proverbs xii, 10). Judaism continued to teach kindness to animals after Biblical times and the Talmud contains many exhortations to that end—for example, a man may not sit down to a meal until after he has fed his animals.

It must be remembered, however, that Jewish laws and customs were established not entirely on purely religious grounds but also for economic and other reasons. Doubts may thus be raised as to the degree of emphasis which should be placed on the purely humanitarian aspects of some of the dictates of Judaism. But since God created all life, He could obviously not be unmindful of the treatment which man imposed upon His handiwork.

Jesus Christ inherited, and unquestionably accepted, the inherent regard for animal welfare enunicated in the Jewish Creed. He stressed the fact that God was ever mindful of the wants of animals. Christ preached to the Jews, not to the Gentiles, and He took it for granted His hearers had an inborn regard for animal welfare. " Behold the fowls of the air . . . for they sow not, neither do they reap, nor gather into barns; yet your heavenly Father feedeth them ". (Matthew vi, 26). " Are not two sparrows sold for a farthing and one of them shall not fall to the ground without your Father?" (Matthew x, 30). Luke also in Chapter xii, verse 6, bears witness that Jesus said, " Are not five sparrows sold for two farthings, and not one of them is forgotten before God ". Evidently God, the Father, is just as concerned for the two as for the five.

Although direct commands to show kindness to animals may not be prominent in the recorded words of Christ, it was constantly reflected in his teachings. " What man shall there be among you that shall have one sheep, and if it fall into a pit on the Sabbath day, will not lay hold on it, and lift it out " (Matthew xii, 11). " What man of you, having a hundred sheep, if he loose one of them, doth not leave the ninety and nine in the wilderness and go after that which is lost, until he find it? And when he hath found it, he layeth it on his shoulder rejoicing. And when he cometh home, he calleth together his friends and neighbours, saying unto them, ' Rejoice with me; for I have found my sheep which was lost ' ". (Luke xv, 4 & 6). Christ taught that

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consideration for others—animals as well as fellow men—was a virtue to be practised by his hearers and that such laudable conduct would not go unrewarded. " Blessed are the merciful for they shall obtain mercy ". (Matthew v, 7). " Inasmuch as ye have done it unto the least of these my brethren, ye have done it unto me ". (Matthew xxv, 31, 34-40). St. Paul obviously understood Christ's attitude in such matters for, in his Letter to the Romans (viii, 19), he wrote " The earnest expectations of the creature waiteth for the manifestations of the sons of God ". Some doubts, however, may arise as to St. Paul's views on the attitude of the Almighty towards animals for, in I Corinthians, ix, 9 he asks: " Doth God care for oxen?" Incidentally, Christians owe to St. Paul (Galatians v, 1 etc.) the fact that they need not observe many of the Jewish customs and laws which are so strictly preserved by the orthodox Jew—including those of ritual slaughter, which has been adopted by the Muslims. This ritual, it is stated, was conceived for reasons of humanity to animals and in the interests of food hygiene. The ancients believed that the soul resided in the blood. " The life is the blood ". Hence blood was taboo and should not be consumed. Undoubtedly this belief, which was widespread, was one reason for the practice of ritual slaughter, indeed, it seems reasonable to assume it was the primary reason.

The food hygiene laws of progressive states are more in accord with scientific principles and much more comprehensive than those of the ancient Jewish lawgivers. The ancient practices do not give sufficient safeguards to satisfy modern public health requirements. Modern advances in humane slaughtering methods, offer a less painful end for our food animals than ritual slaughtering methods, which in ancient times were undoubtedly of benefit to animals under the conditions then prevailing in other communities. But surely it cannot be denied that advances have been made in the last thousand years or so? Jews no longer adhere to certain of their ancient legal principles, such as those which demand the death penalty for sexual offences (Lev. xx). Might one dare to hope that the words of the prophet Isaiah (xi, 6-9) may yet come to pass? " For the earth shall be full of the knowledge of the Lord, as the waters cover the seas ".

Christ did not exhort his hearers to refrain from committing such crimes as murder—which any decent minded person would avoid in any case. His was the gospel of love and mercy—for love's sake alone and not for any selfish motive. He expected that his followers would be decent minded in their attitude to animals. The Christian attitude towards animals, however, is not necessarily one of sentiment or mere pity; it recognises that, subject to certain inherent conditions, animals should be allowed to enjoy what they can of life within the limitations placed upon them by the God of love, who created all things good. Human love should reflect this divine beneficence which embraces all created life. Christ did not place the welfare of animals above that of man. Animals are on earth for the food and use of man—but not for man's abuse. That Christ accepted this principle of the Jewish religious faith is obvious. Let me refer back to the reference to the sparrows. If you read the next sentence, you will note Christ said " But the very hairs of your head are numbered. Fear ye not therefore, ye are of more value than many sparrows (Matthew x, 31). Luke (xii, 7) contains this statement almost word for word, " But even the very hairs on your head are all numbered. Fear ye not therefore; ye are of more

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value than many sparrows ". The same idea is to be found in Luke xii, 24 and Matthew vi, 26. " Consider the ravens, for they neither sow nor reap; which neither have storehouse nor barn; how much more are ye better than the fowls?" " Behold the fowls of the air; for they sow not, neither do they reap, nor gather into barns; yet your heavenly Father feedeth them. Are ye not much better than they?"

Some suffering must inevitably occur from time to time to all that have the ability to ' feel '. The realisation of suffering presumably varies with the species, and one is probably correct in assuming that the more highly the brain and nervous system are developed then the greater is the ability to feel pain and to suffer. Warm blooded animals are doubtless more capable of appreciating pain than are the cold blooded animals such as fish. The degree of suffering will thus vary with the development of the species.

The action of Christ in acceding to the request of the legion of devils, which he was about to cast out of the demented man, to enter into the herd of Gardarene swine, which—when the request was granted—immediately rushed down a steep slope into the sea and were drowned (Mark v, 1-21), has given rise to much perplexity of thought in the minds of animal lovers. Can we assume from this incident that Christ did not consider it wrong to use animal life for the welfare of man?

Christ was not a vegetarian—he enjoyed good food and wine. He was not adverse to telling Simon Peter where to cast the net in order to get the best catch of fish (Luke v, 4-7) and he said he would make his disciples ' fishers of men ' (Mark 1, 17). He never discouraged his followers from seeking their sustenance from the sea: but there can be no doubt He would have condemned the taking of life without adequate reason.

Most people incline to the view that, for the Christian, the Bible contains remarkably little directly concerning animal welfare and man's duty to the lower creatures—and that most references concerning man's attitude to animals are to be found in the Old Testament. This is undoubtedly the case, but one should not draw the erroneous conclusion that the Christian should not be concerned for animals and that the Almighty is indifferent to the way man treats them.

The New Testament is a testament of love and mercy. The gospel of compassion and love—freely given and freely to be given.

The truth is that the Christians, with few marked exceptions like those of St. Francis of Assisi, have not appreciated fully the ideals upon which Christ sought to inspire his followers. But there have been many other ideals which have been neglected and forgotten. Can one wonder that man tended to disregard the welfare of animals when he so blatantly disregarded the rights of his fellow men? I need hardly remind you of the horrors of the slave traffic or the exploitation of child labour, both of which were accepted with complacency a mere hundred years or so ago. Even the hymns sung in those days tended to encourage and perpetuate the idea of a state of feudalism and fatalism in the minds of the populace. " The rich man in his castle, the poor man at the gate. God made them high or lowly and ordered their estate ". Good Christians lived and grew fat on the sweat of children and slaves and, apparently, their right to do so was not questioned. St. Paul's advice to the

runaway slave—to go back to his master—was no doubt accepted and quoted as permitting the ownership of slaves, as one may own a herd of cattle.

Christ surely would wish that we had regard for animals for the repercussions it must have on our attitude to our fellowmen, if for no higher motive. But surely He had higher motives than that? It is a remarkable fact that the public conscience, when aroused to protect animals, has been stimulated to rectify injustice to man. The National Society for the Prevention of Cruelty to Children was started in the council chambers of the Royal Society for the Prevention of Cruelty to Animals. In the United States of America, the humane societies are concerned both with child and animal welfare. The pioneers in the abolition of slavery in the British Empire were active in attempting to secure legal protection for animals against the abuses of man. Christians cannot claim that the welfare of animals should take precedence over the welfare of man. They should maintain a sane and rational balance in thought and action. Not the cynical attitude exemplified by the phrase " The more I see of man, the more I love—or respect—my dogs ".

There is little doubt that the cause of animal welfare has been affected adversely, rather than otherwise, by the attitude of many Christian and other theologians. In this connection, C. W. Hume—in his ' Status of Animals in the Christian Religion '—states " That kindness to animals is a virtue and cruelty is a sin is only half heartedly recognised by theologians ". The thesis that animals have no rights has done incalculable harm and clouds the real issue: for as Dom Ambrose Agius says—' Cruelty to Animals ' (Catholic Truth Society)—" Right thinking man acknowledges the animal world as a commission from God, given for his use; for which he will have to render an account to the Creator . . . Beware, lest you infringe, not the animal's rights, for as such he has none; but God's right over him."

A heavy burden lies on the priesthood, for public opinion may be directed—willingly or otherwise—in the wrong way by the theologian. Christianity originated when the mass of the peoples were uneducated—certainly Judaism and some other religions were born in even earlier times. Christ was not persona grata with the priests of his day. He mentioned the grave disabilities which great possessions entailed and said " Unless you become as little children, ye shall not enter the Kingdom of Heaven " (Mat. xviii, 3) and " Whosoever shall not receive the Kingdom of God as a little child, he shall not enter therein " (Mark x, 15).

A sense of right and wrong must be inherent in all persons if religion is to be freely available to all. Either one feels a sense of right and wrong instinctively or one is devoid of conscience.

" Finally, brethren, whatsoever things are true, whatsoever things are honest, whatsoever things are just . . . if there be any virtue . . . think on these things " (Phil. iv, 8).

Whilst taking full responsibility for the opinions expression, the author wishes to acknowledge the help given by R. F. Rattry, M.D., Ph.D., Cambridge, who read and commented upon the original rough draft. References not given in the text which have been freely quoted:—

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REVIEWS

JOINT WHO/FAO EXPERT COMMITTEE ON ZOONOSES. Second Report. *World Health Organization*: Technical Report Series, 1959, No. 169, 82 pages. Price 3/6d.

The term "zoonoses" has been re-defined as "those diseases and infections which are naturally transmitted between vertebrate animals and man", of which more than 100 are now recognised. Salmonellosis, leptospirosis, animal tuberculosis, anthrax, psittacosis (ornithosis), Q fever, arthropod-borne viral encephalitides, and hydatidosis were discussed extensively by the Committee which met in August 1958; some of the other zoonoses were more briefly considered. Useful notes on technical aspects of control are included as appendices.

Salmonella infection is widespread and over 500 types of salmonella are known; nearly all have been found in animals. The common one is *Salmonella typhi-murium;* the incidence of other types waxes and wanes from time to time and from place to place. Poultry meat is playing an increasingly important role as a source of human infection; cattle may harbour many types, as well as *S. dublin* which is the common cattle one, therefore it is advisable to examine by bacteriological methods the organs of animals dying from a gastro-enteritis. From 1% to over 30% of dogs may be infected and more than 50 types have been found in this species. The incidence in cats may be up to 12% and more than 40 types have been recovered. Cattle and pigs are known to become infected without showing signs of illness and abattoir contaminations of meat may cause outbreaks in man. Animal foodstuffs and fertilizers may be heavily contaminated and have been known to be responsible for introducing uncommon types into an importing country. There is a general lack of information on the true incidence of salmonella infection in man and animals in all countries.

Leptospirosis occurs all over the world and the spread of infection is usually from animal to animal and from animal to man. Rats, field mice and dogs are known to be primary carriers; infection has now been discovered in bats, mongooses, bandicoots, shrews, hedgehogs, jackals, foxes, opossums, racoons, skunks and wild cats. In some countries, leptospirosis has become a major problem in cattle and pigs; in some areas, sheep, goats and horses are infected. Infection is often localised in the kidneys and leptospira are excreted in the urine; if infected urine is excreted into water or mud which is neutral or slightly alkaline the organisms may survive for weeks. Some leptospira attack one animal species only; other may infect a number. *L. canicola* is found principally in the dog but it has been recovered from cattle, pigs and jackals.

The Committee expressed the opinion that vaccination has no place in the eradication of tuberculosis in cattle. They also consider that chemo-therapy, a useful adjunct in the human disease, has no place in animal tuberculosis and it should be discouraged.

Studies made in economically advanced and in less developed regions suggest that the true incidence of anthrax in man may be two to ten times the figure of 9,000 which is the number recorded for the year. Fortunately inhalation anthrax is now rare; early diagnosis and treatment with penicillin or other broad spectrum antibodies have reduced the mortality of the cutaneous form in man to almost zero. In badly infected areas, animals should be vaccinated at regular intervals and it is recommended that when anthrax has been diagnosed in a herd then it is advisable to keep the herd in quarantine for a couple of weeks.

Psittacosis is an infection of man or psittacine birds with one of the psittacosis-lymphogranuloma group of viruses. The term 'ornithosis' is used for the same infection in birds other than psittacines. About 100 species of birds are naturally infected and an acute infection is sometimes severe in turkeys, ducks, and pigeons. Viruses of the group may infect mammals and man may acquire infection if exposed

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to such conditions as enzootic abortion in ewes. It appears as if man may be the primary host of some strains of this group of viruses.

Q fever is known in more than 50 countries and domestic ruminants appear to be the most important reservoirs of the responsible rickettsia (*Coxiella* or *Rickettsia burnetti*). Infection occurs by the direct respiratory route and in addition it may be transmitted by ticks. Although most cases in man are mild, the disease is legally recognised in some countries as an occupational hazard of abattoir workers.

The arthropod-borne viral encephalitides are caused by viruses sometimes referred to as 'arbor' viruses. There are over 70 and some are mosquito-borne and some are conveyed by ticks. The control of the tick-borne encephalitides is less difficult than control of those which are mosquito-borne. Trans-ovarian transmission of the virus has been demonstrated in vector-ticks and there is no difficulty in explaining the survival of a virus nor in its geographical distribution. Climatic factors undoubtedly influence the incidence of mosquito-borne forms and wild birds may play a part in the cycle. Viruses survive through the winter months and the natural history of these mosquito-borne virus infections is not sufficiently understood to make satisfactory control practicable.

Hydatidosis caused by the cystic stage of the small tape-worm *Echinococcus granulosus* is of economic and of public health importance. The definitive host is the dog. A similar worm involves foxes in some Pacific areas and it is transmitted to form the cystic stage in wild rodents. Man is susceptible and the dog may serve as host for this adult worm.

Consideration was given to animal influenza and its possible relationship to human influenza. There has been much speculation as to the possible role of pigs and other animals as inter-epidemic reservoirs of the human virus. An animal serum survey in about 25 countries has been organized and the immediate purpose is to find out if the A2 strain (the Asian 'flu' strain) existed in the animal population before the epidemic struck a particular country. It is known that type A strains exist in horses in central and northern Europe and in pigs in U.S.A. Furthermore, the virus of fowl plague and two strains from ducks all belong to type A. The significance of these facts cannot however be evaluated at the present time.

Toxoplasmosis is causing increasing concern; the infection of man and animals may be severe and the epidemiology of the disease needs clarification. Listeriosis was also discussed; the causative agent, *Listeria monocytogenes* is widely distributed and causes an encephalitis in cattle, sheep and goats; the human disease is characterised by a meningo-encephalitis and infection of the new born occurs. Recently, infections with *Fasciola hepatica,* the common liver-fluke of domestic animals, have been reported in man. *Tularaemia,* a common disease of various wild animals in the northern hemisphere may occasionally affect sheep; it is transmissible to man.

The ecology of wild animals is an important study and several important zoonoses have wild animal reservoirs. Animals, new to an area, may be introduced for the biological control of vermin without due regard to the effect they may have on human health. The introduction of the Javan mongoose into the Caribbean islands and of ferrets into Cuba for the control of rats was followed by the establishment of new reservoirs of rabies. The Committee condemn the use of vermin killers containing living pathogenic organisms.

A large number of strains of Viruses from man and animals have been uncovered, principally by tissue culture. Their importance as disease producing agents is not clear and those from man have been called Echo (entero-cytopathogenic human 'orphan') viruses. They have been called 'viruses in search of a disease'. The continued study and grouping of them is essential for some may be related; for example, the HA 1 (haem-adsorption virus type 1) of human respiratory origin may be involved in shipping fever of cattle.

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This report brings to our notice the new knowledge and field experience recently accumulated of some of those diseases which are important to the medical and veterinary services. Close collaboration in their control is essential.

FUNGAL DISEASES OF ANIMALS. Ainsworth, G. C. and Austwick, P. K. C. (1957). XII + 148 pp. 25 pls. 20/-. Commonwealth Agric. Bureaux.

This appears to be the first book on this subject in the English language and it is stated to be written primarily for teachers and students in veterinary schools; it should also be of great value to practitioners who require an up to date and concise text. The increasing knowledge of the role played by fungi in the aetiology of animal diseases has revealed the need for such a book. Both authors have had close contact with veterinary problems and a token of their extensive reading is shown by the bibliography of more than 650 references. Eight of the 25 plates are coloured and the remainder are in black and white; they are excellent and it is a pity that the printing of the text is of the lithographic kind.

There are in all 17 chapters and accounts are given of aspergillosis, moniliasis, epizootic lymphangitis, sporotrichosis, bovine mycotic abortion, mycotic mastitis, ringworm, poisonous fungi and a number more. The mycosis of animals have not been reviewed previously and this is an attempt to survey all aspects of the literature of fungal infections of higher animals. In many of the chapters the authors refer to the confusion existing in the literature because of the uncertainties surrounding the identity of the pathogen and the lack of agreement concerning nomenclature. This book should help in some ways but in others it tends to discourage the student when he finds lists of synonyms, lists of pathogens and lists of hosts; he might well ask what proof there is of the role played by many of the fungi listed in the aetiology of the disease which is discussed. Conditions are described under the headings of geographical distribution, pathology, epidemiology, treatment and control. In bovine mycotic abortion a list of 18 pathogens is given; pathogenicity for experimental animals has been established in some. Mycotic mastitis has been associated with more than 26 species of fungi and has generally followed antibiotic treatment of bacterial mastitis. Actinomycosis and nocardiosis are dealt with briefly and it is said to be impossible to give an integrated account of the latter because of inadequate descriptions of the clinical findings and of uncertainties regarding the identity of the recorded pathogen. Streptothricosis which has been known in cattle in Africa for about 50 years is related to mycotic dermatitis and strawberry foot rot in sheep. The literature on ringworm is admitted to be large and confusing; most dermatophytes attack more than one host and animals are the major source of ringworm in man.

The authors should be congratulated and thanked for attempting such a task. Perforce they have been obliged to be less critical than is desirable and in so many cases have not pointed the way out of the confused state in which this aspect of mycology finds itself. It is unfortunate that they were not more drastic in their approach: it is illogical to discuss aspergillosis which is called by this name because the infection is "caused by species of *Aspergillus*" and give equal emphasis to bovine mycotic abortion in which variations of Aspergillus, Mucor, Nocardia, Candida and others may be involved. The fungal diseases could be classified according to the aetiological agent involved or on clinical grounds. It perpetuates confusion to use both systems in one small book, especially in one which is written primarily for teachers and students in veterinary schools.

SILAGE & HAYMAKING. Ian Moore, M.Sc., Ph.D., N.D.A. Dip. Agric. (Cantab.) "Farmer & Stockbreeder" Manual. 9s. 6d.

Professor H. I. Moore, Principal of Seal-Hayne Agricultural College, has recently added to his formidable list of books on crop husbandry. "SILAGE & HAYMAKING" published by the "Farmer & Stock-Breeder" appeared on the scene at

the beginning of the " harvest season " and in time to bring all concerned with providing next winter's keep, up to date with the various methods, at their disposal, of conserving grass.

The author's enthusiasm for and appreciation of this country's most important crop can be summarised by an extract from the opening chapter—

" The potential of the grass crop is obviously immense and its exploitation becomes increasingly important to the prosperity of farming and of farmers as the years pass ".

Methods and costs of conservation, and factors to consider in deciding which to adopt are dealt with systematically and clearly; the technique of silage making being dealt with in greatest length.

Professor Moore is to be thanked for his concise and practical manual which has a rare balance between making and feeding.

The report of the Committee on Grassland Utilisation (Nov. 1958) (of which Professor Moore was a member) recommends that—" every means should be taken to improve both the general and technical education available to farmers so that they may meet with confidence the problems of farm management, especially those involved in improving grassland utilisation ".

Professor Moore has made a valuable contribution to this end.

" GRUNDRISS DER PHYSIOLOGISCHEN CHEMIE FUR VETERINARMEDIZINER HUMANMEDIZINER UND BIOLOGEN ". (An Outline of Physiological Chemistry for Veterinary Surgeons, Doctors and Biologists). Third Edition—1959.

As a basic outline of general mammalian biochemistry this book is up to date and reliable. The concentrations of many of the constituents of body fluids are presented on a comparative basis; in most cases figures are given for several domesticated or laboratory animals. The essential facts relevant to digestion in ruminants, non-ruminant herbivores and birds are discussed; although the presentation is a little brief. The causes and possible therapy of ruminant ketosis are presented briefly, but in this still uncertain field, current opinions would in many cases conflict with those set forth in this book.

No references are given to substantiate the text, but the book would be a reliable text-book for veterinary students in view of its comparative treatment, and the substantial revision which is stated to have been carried out in the third edition.

NOTICE

Smith Kline & French Laboratories Ltd., manufacturers of the nitrofuran products ' Bifuran,' ' Nefco ' and ' Neftin,' are moving to new premises at Welwyn Garden City, Herts. As from August 28th, 1959, their address will be :—
Smith Kline & French Laboratories Ltd., Welwyn Garden City, Herts.